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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/748,141	12/27/2000	Yoshihisa Abe	44319-056	3302

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EXAMINER

MCCARTNEY, LINZY T

ART UNIT	PAPER NUMBER
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2671

DATE MAILED: 11/20/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/748,141

Applicant(s)

ABE, YOSHIHISA

Examiner

Linzy McCartney

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— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 April 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-8,14-22 is/are rejected.
- 7) ☐ Claim(s) 2 and 9-13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 December 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4. 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3, 8, 14 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garland et al., "*Surface Simplification Using Quadric Error Metrics*" (Garland) in view of U.S. Patent No. 5,590,248 to Zarge et al. (Zarge).

- a. Referring to claim 1, Garland discloses calculating estimation values for surfaces to be deformed by shrinking edges or surfaces of a polygon model by converging two or more vertices of the polygon model based on distances between the respective surfaces and all the original vertices involved in the surface deformation, ("... We can associate a set of planes... we can define the error of the vertex with respect to this set as the sum of squared distances to it planes..." – page 4, paragraph 1 and "...Compute the Q matrices for all initial vertices... The error... of this target vertex becomes the cost of contracting this pair... place all the pairs in a heap keyed on cost..." – page 3, Section 4.1, paragraph 2) and reducing the number of data for the polygon model by shrinking edges or surfaces of the polygon model ("... Iteratively remove the pair... contract this pair..." -- page 3, Section 4.1, paragraph 2 and Figure 1). Garland does not expressly disclose comparing the calculated estimation values with a predetermined permissible value or reducing the number of data when the estimation values are equal to or below the predetermined

permissible value. Zarge discloses a method for reducing the complexity of a polygonal mesh by comparing a calculated estimation value with a predetermined permissible value and reducing the number of data when the estimation values are equal to or below the predetermined permissible value (“...if the distance is less than a pre-selected decimation threshold...” – column 3, line 7-12 and Fig. 1). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify the method of Garland to compare the calculated estimation values with a predetermined permissible value and reduce the number of data when the estimation values are equal to or below the predetermined permissible value as taught by Zarge because it would allow the user to specify a target reduction (“The user can specify the target reduction...” – Zarge, column 4, lines 49-56).

b. Referring to claim 3, Garland discloses the polygon model includes a number of triangular polygons (“We assume that the model consists of triangles only...” – page 1, paragraph 4).

c. Claim 8 is rejected with the rationale of the rejection of claim 1. Claim 8 is merely claim 1 recited as an apparatus.

d. Claim 14 is rejected per claim 8 with the rationale of the rejection of claim 3. Claim 14 is merely claim 3 recited as an apparatus.

e. Claim 20 is rejected with the rationale of the rejection of claim 1. Claim 20 is merely claim 1 recited as an apparatus.

3. Claims 4-7, 15-19, and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garland in view of U.S. Patent No. 6,262,737 to Li et al. (Li).

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a. Referring to claim 4, Garland discloses calculating respective estimation values for a plurality of portions of a polygon model that are to be deformed by converging two or more vertices of the polygon model (“...Compute the Q matrices for all initial vertices...The error...of this target vertex becomes the cost of contracting this pair...” – page 3, Section 4.1, paragraph 2) and reducing the number of data for the polygon model by converging two or more vertices of one portion of the polygon model based on the calculated estimation values after another portion, repeatedly (“...Iteratively remove the pair...contract this pair...” – page 3, Section 4.1, paragraph 2 and Figure 1). Garland does not disclose wherein before each data reduction, the portion that has been involved in all the previous data reductions is defined as a reduction prohibition area, and a succeeding data reduction is applied to a portion other than the reduction prohibition area. Li discloses performing independent edge collapses, i.e. edge collapses that do not share a vertex (“...two edge collapse operations...are independent of each other if they do not share any common vertex...a mesh simplification may be conducted...where independent edge collapses are performed in the same layer...” – column 12, lines 22-35). Inherently, to ensure the aforementioned edge collapses are independent they must be marked in some fashion. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify the method of Garland to perform independent edge collapses as taught by Li. The suggestion\motivation for doing so would have been to force pair contractions to be spread evenly over the surface of the model to ensure the model is simplified across its entire surface in a balanced way (Li, column 12, lines 32-35).

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- b. Claim 5 is rejected per claim 4. The modified method of Garland as applied to claim 4 meets the limitations recited in claim 5 except "...wherein the reduction prohibition area is released if a predetermined condition is satisfied." Li discloses that mesh simplification is performed on several consecutive layers and independent edge collapses are performed in the same layer ("...mesh simplification may be conducted through several consecutive layers...independent edge collapses are performed in the same layer..." – column 12, lines 28-30), so upon simplification of each layer the prohibition area is released. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify the method of Garland to release the reduction prohibition area if a predetermined condition is satisfied as taught by Li. The suggestion\motivation for doing so would have been to force pair contractions to be spread evenly over the surface of the model to ensure the model is simplified across its entire surface in a balanced way (Li, column 12, lines 32-35).
- c. Claims 6 and 7 are rejected per claim 5. The modified method of Garland as applied to claim 5 meets the limitations recited in claims 6 and 7. As noted in the rejection of claim 5 above the reduction prohibition area is lifted after all vertices have been processed for a particular layer which meets the limitations recited in claims 6 and 7.
- d. Claim 15 is rejected with the rationale of the rejection of claim 4. Claim 15 is merely claim 4 recited as an apparatus.
- e. Claim 16 is rejected per claim 15 with the rationale of the rejection of claim 4. Claim 16 is merely claim 4 recited as apparatus.

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f. Claim 17 is rejected per claim 15 with the rationale of the rejection of claim 5.

Claim 17 is merely claim 5 recited as an apparatus.

g. Claim 18 is rejected per claim 17 with the rationale of the rejection of claim 6.

Claim 18 is merely claim 6 recited as an apparatus.

h. Claim 19 is rejected per claim 17 with the rationale of the rejection of claim 7.

Claim 19 is merely claim 7 recited as an apparatus.

i. Referring to claim 21, Garland discloses the portion to be converged is an edge of a triangular polygon ("Our simplification algorithm is based on the iterative contraction of vertex pairs..." – page 2, column 2, paragraph 3 and Figure 10).

j. Referring to claim 22, Garland discloses the portion to be converged is a surface of a triangular polygon (Figure 1).

Allowable Subject Matter

4. Claims 2 and 9-13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Linzy McCartney** whose telephone number is (703) 605-0745.

The examiner can normally be reached on Mon-Friday (8:00AM-5:30PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Mark Zimmerman**, can be reached at (703) 305-9798.

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Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive,

Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

ltm
November 12, 2002



MARK ZIMMERMAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600